CONFIDENTIAL

Specification No. 62-A-1140-A

PRODUCTION SPECIFICATION

FOR DIGITAL DISPLAY UNIT, DR-1

Dated: 23 February 1962

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1. DESCRIPTION OF SYSTEM

The DR-1 is a miniature receiving device which displays numerical messages. The display panel consists of numbered lamps illuminated in accordance with information contained in coded audio tones. The tones are supplied by an associated radio receiver, which is not part of the display unit. These tones are generated by a companion unit, DT-1, and sent as amplitude modulation by a distant high frequency transmitter. To use the DR-1, the operator connects it to his receiver audio output and tunes the receiver to the distinctive tone signal being transmitted on a prearranged frequency. The modulation and coding technique used in this system has been found effective in the radio environment for which it is intended.

2. REQUIREMENTS

A requirement exists for 100 production DR-1 digital display units with instruction manuals and accessories. This production shall be accomplished in two phases. Phase I shall consist of the fabrication of five units built to production drawings. Upon acceptance of these units by the customer, the fabrication of the remaining 95 units shall constitute Phase II. The performance of production units must be equivalent to or better than that of a prototype to be supplied as Government furnished equipment. In the interests of improving reliability and with the approval of the contracting agency the contractor may employ design or packaging techniques which differ from those used in the prototype, except that:

2.1. Electrical compatibility with the associated receiver and tone generating equipment (DT-1), must be maintained.

2.2. Display and control functions of production units must be identical to those on the prototype.

2.3. The method of attaching batteries to the DR-1 shall be essentially the same as that used in the prototype.

3. QUALITY OF FABRICATION

3.1. MIL Specifications

The fabrication of this equipment shall comply with the requirements of MIL specifications in effect on the date of initiation of the contract except in those cases where this specification differs from the MIL specifications or a waiver of MIL specifications requirements has been authorized by the Government in accordance with paragraph 3.2. This specification shall have precedence over MIL specifications in the event of difference.

3.2. Waiver of MIL Specifications

In the interest of economy and/or improved performance, waivers of MIL specifications may be authorized but only after review by the technical representative of the Contract Officer.

3.3. Fungus Treatment

All material used in the DR-1 shall be non-nutrient to fungus. If it is determined that suitable non-nutrient materials are not available, a waiver may be obtained; however, any nutrient material used shall be treated by a suitable fungus-resistant compound after machining or forming and prior to installation.

4. ENVIRONMENTAL

After a warm-up period of five seconds the DR-1 shall meet the performance requirements of this specification while subjected to any of the following conditions successively or in combinations likely to be encountered during worldwide operation and storage.

4.1. Operation

Continuous operation for a period of one year alternating six hours on and two hours off with no more than normal maintenance and replacement of batteries and parts.

4.2. Temperature

The DR-1 shall operate normally in all respects in a temperature range from -20°C to +40°C, after soaking for four hours, and shall be capable of being stored over a temperature range of -60°C to +60°C. The foregoing requirement shall not apply to the battery power supply of the DR-1.

4.3. Relative Humidity

The DR-1 shall operate normally in 95% relative humidity.

4.4. Elevation

The DR-1 shall operate normally at elevations up to 15,000 feet above sea level.

4.5. Vibration

The DR-1 shall operate without impairment after being subjected to vibrations from 5 to 500 cps and having a double amplitude of .01 inches with a maximum acceleration of 2g, whichever is the limiting value.

4.6. Shock

The DR-1 shall operate without impairment after dropping through an angle of 30° to a solid 2-inch fir table top using any edge of the case as an axis.

5. ELECTRICAL CHARACTERISTICS

5.1. Input Characteristics

5.1.1. The input impedance of the DR-1 shall be 2,000 ohms.

5.1.2. The DR-1 shall operate properly with a 0.3 volt rms signal at a 3 db signal-to-noise ratio. The unit shall operate properly over an input level range of 0.3 volts rms to 10.0 volts rms. (Note: Proper operation is defined as 100% copy under test when connected directly to the DT-1)

5.2. Signal Characteristics

Each digit transmitted is represented by a composite signal consisting of four sequential tones each of which is 40 milliseconds in duration and which are separated by 40 milliseconds. The transmitting speeds of the DR-1 are 5, 7½, 10 or 12 wpm. These different speeds are obtained by varying the spacing between groups of binary tones. The different spacings are: 2,120, 1,320, 920, and 729 milliseconds, respectively.

5.2.1. Two tones are used with frequencies of 1000 cps and 1100 cps. The DT-1 tone generator maintains the accuracy of these tones to within ±3 cycles.

5.2.2. Coding

The digits to be transmitted are represented by the following binary code. In the table below "0" represents a 40 millisecond 1,000 cps tone, and "1" represents a 40 millisecond 1100 cps tone.

Number	Binary Code
1	0000
2	0001
3	0011
4	1001
5	1000
6	1101
7	0010
8	1100
9	1111
0	0111

5.3. Supply Voltage and Current Drain

The DR-1 shall operate properly on supply voltages which range from 2.0 volts to 3.2 volts with the maximum current drain not exceeding 200 milliamperes.

6. PHYSICAL CHARACTERISTICS

6.1. Control Panel

The control and display panel of the existing prototype shall be used in production models. The only operator control on the DR-1 is an on-off-test switch. The test position allows the operator to determine whether his battery is usable by observing a test lamp which flashes when the momentary-hold test switch is depressed.

6.2. Battery Holders

The battery supply for the DR-1 shall consist of two external size "D" batteries. They may be held in place by two-hinged doors which fold out from the bottom of the DR-1 as in the prototype unit. However, the contractor, in order to facilitate production, may propose another type of battery holder using the same concept. The battery holder shall be capable of accommodating zinc oxide, mercury or rechargeable nickel-cadmium size "D" cells.

6.3. Size

The size of the DR-1 shall be 3 x 2 x 7/8 inches or less. Any improvements in packaging or circuitry shall not cause an increase in size.

DELIVERABLE ITEMS

Phase I

Item	Quantity
1. Digital Display Unit, DR-1	5 each
2. Cable, Radio Receiver to DR-1	5 each
3. Test Cable, DT-1 to DR-1	5 each
4. Power Supply Cable, External 3 Volts to DR-1	5 each
5. Spare Indicating Lamps	15 each
6. Indicating Lamp Removal Tool (if necessary)	5 each
7. (Preliminary) Instruction Manual	10 each

Phase II

Item	Quantity
1. Digital Display Unit, DR-1	95 each
2. Cable, Radio Receiver to DR-1	95 each
3. Test Cable DT-1 to DR-1	95 each
4. Power Supply Cable, External 3 Volts to DR-1	95 each
5. Spare Indicating Lamps	285 each
6. Indicating Lamp Removal Tool (if necessary)	95 each
7. Operator's Instruction Manual	150 each
8. Theory, Maintenance and Parts List Manual	50 each
9. Production Drawings, Reproducible	1 set
10. Production Drawings, Copies	2 sets
11. Production Tooling	1 lot